W. I. A.—6. Issued October 9, 1915.

United States Department of Agriculture,
BUREAU OF PLANT INDUSTRY,
Western Irrigation Agriculture,
WASHINGTON, D. C.

THE WORK OF THE SCOTTSBLUFF RECLAMATION PROJECT EXPERIMENT FARM IN 1914.[1]

By Fritz Knorr, *Farm Superintendent.*

INTRODUCTION.

The experiments conducted at the Scottsbluff Experiment Farm in 1914 included crop rotations, methods of irrigation, the testing of various crops to determine those best adapted to local conditions, tests of various methods of disposing of alfalfa and other crops through the feeding of live stock, and the testing of shade trees and small fruits, vegetables, and ornamental shrubs. These experiments followed the same general lines as in 1912 and 1913,[2] except that the fall irrigation experiment was discontinued.[3] All of the above-mentioned work is carried on under irrigation. In addition, about 30 acres of the land on the farm are used for dry-land experiments conducted by the Office of Dry-Land Agriculture. In the present paper the progress of the work with irrigated crops in 1914 is briefly discussed. The arrangement of the fields and the location of the experiments in 1914 are shown in figure 1.

[1] The Scottsbluff Experiment Farm is located on the North Platte Reclamation Project, 6 miles east of Mitchell and about 8 miles northwest of Scottsbluff, Nebr. The tract consists of 160 acres of land irrigated from the Government canal. Although the entire tract is irrigable, about 30 acres are devoted to dry-land experiments. The land was withdrawn from entry by the Department of the Interior for use as an experiment farm and operations were begun in 1909. The three original farm buildings were erected by that department. The farm is operated under a superintendent detailed by the Office of Western Irrigation Agriculture. The work is supported in part by Federal appropriation through the United States Department of Agriculture and in part by a State appropriation through the University of Nebraska. The buildings on the farm, in addition to the three original structures, have been erected from State funds.

[2] Knorr, Fritz. The work of the Scottsbluff Reclamation Project Experiment Farm in 1913. U. S. Dept. Agr., Bur. Plant Indus. Doc. [Misc. Pub.] 1081, 19 p., 5 figs. 1914.

[3] Knorr, Fritz. Experiments with crops under fall irrigation at the Scottsbluff Reclamation Project Experiment Farm. U. S. Dept. Agr. Bull. 133, 17 p., 5 figs. 1914.

5926°—15——1

CONDITIONS ON THE PROJECT.

WEATHER CONDITIONS.[1]

The weather conditions in 1914 were not as favorable for crop production as in 1912 and 1913, the precipitation being much less than in either of the two previous years. The frost-free period was 11 days shorter than that of 1913, but as the average temperature was somewhat higher during the summer months of 1914 than in 1913 the crops matured more rapidly.

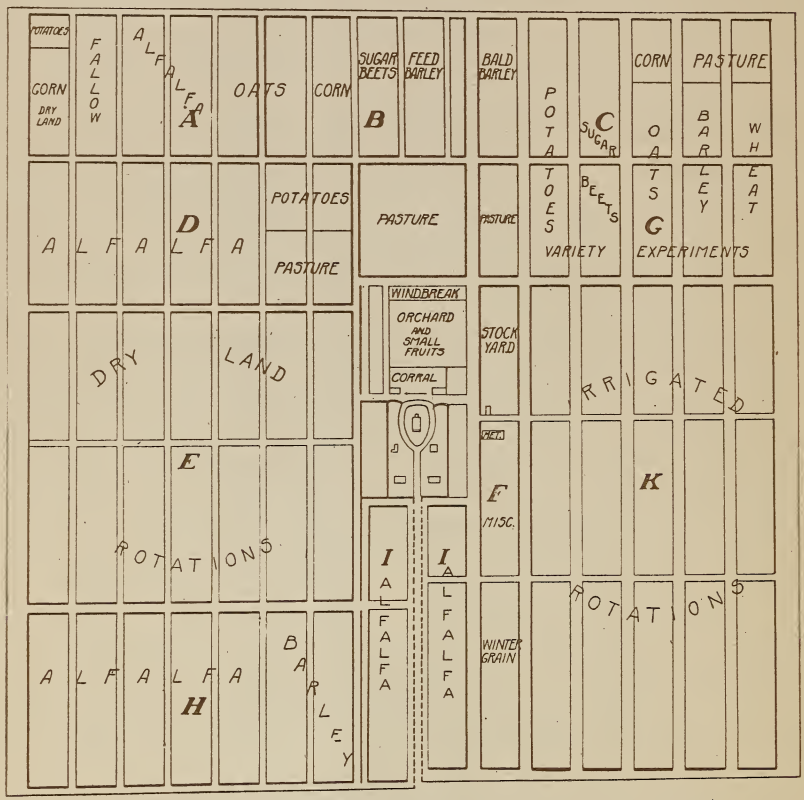

FIG. 1.—Diagram of the Scottsbluff Experiment Farm, showing the arrangement of the fields and the location of the experiments in 1914.

Table I summarizes the results of the climatological observations made during 1911, 1912, 1913, and 1914.

Because of less favorable weather conditions, the crops on the project were not as good in 1914 as in the two previous years. On account of the extremely dry season some of the less efficient irrigators obtained very poor results. On the other hand, the better farmers were able to take advantage of the warmer summer weather, and on

[1] The climatological observations at the farm are made in cooperation with the Office of Biophysical Investigations of the Bureau of Plant Industry, the necessary apparatus being furnished by that office.

many farms four cuttings of hay were secured where ordinarily only three cuttings are made.

TABLE I.—*Summary of climatological observations at the Scottsbluff Experiment Farm, 1911 to 1914, inclusive.*

PRECIPITATION (INCHES).

Year, etc.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1911	0.45	0.10	0	2.31	0.81	2.13	1.28	0.65	2.14	1.10	0.08	0.34	11.39
1912	.20	.60	1.27	3.72	1.66	1.61	2.45	2.77	2.70	1.16	.37	0	18.51
1913	0	0	0	.13	3.70	1.71	1.30	4.33	1.18	.47	.11	.80	13.73
1914	0	.04	0	3.18	2.29	1.84	.39	.54	.24	.88	0	.36	9.76

EVAPORATION (INCHES).

1911	.....	.....	.....	5.54	7.15	8.90	9.08	7.43	6.18	.....	.....	.....	44.28
1912	.....	.....	.....	4.24	7.14	6.64	6.67	6.32	4.16	.....	.....	.....	35.17
1913	.....	.....	.....	5.76	6.32	6.80	6.93	6.64	4.69	.....	.....	.....	37.14
1914	.....	.....	.....	4.60	6.42	7.17	8.42	7.91	5.77	.....	.....	.....	40.40

DAILY WIND VELOCITY (MILES PER HOUR).

Mean:													
1911	6.1	6.4	7.8	8.4	8.8	6.0	5.2	5.4	5.4	5.9	6.8	4.9	.....
1912	5.4	5.7	6.7	8.6	8.1	5.4	4.0	4.2	5.0	5.0	4.3	6.4	.....
1913	7.0	4.7	5.8	7.2	7.7	6.1	4.1	3.3	3.8	5.1	3.6	4.5	.....
1914	5.6	5.6	7.3	7.4	6.2	5.2	4.3	4.7	4.8	4.0	3.7	5.1	.....
Maximum:													
1911	15.9	13.7	15.8	14.6	15.2	10.8	8.4	9.2	11.1	12.2	15.6	8.4	.....
1912	12.4	14.7	15.3	31.4	16.6	15.9	6.0	7.0	11.5	10.8	12.6	15.8	.....
1913	22.9	8.3	15.7	18.3	14.9	16.7	9.1	6.9	8.0	15.9	8.2	11.7	.....
1914	10.8	13.8	13.7	13.3	13.8	12.1	6.7	9.2	8.3	11.2	10.0	16.7	.....
Minimum:													
1911	1.7	2.1	3.0	3.6	4.8	3.0	3.1	2.6	2.9	2.5	1.9	1.2	.....
1912	1.6	1.4	2.7	3.2	2.9	1.6	2.0	2.6	2.4	2.0	1.1	1.3	.....
1913	1.9	1.0	1.5	2.5	3.7	.1	.4	.2	.1	.8	1.1	.8	.....
1914	2.1	1.3	1.9	2.9	2.9	2.1	1.3	2.5	1.7	1.9	.5	.3	.....

MONTHLY TEMPERATURE (°F.).

Mean:													
1911	29	27	42	45	46	70	69	68	64	43	32	24	.....
1912	20	24	21	45	55	63	69	67	52	47	39	27	.....
1913	22	15	31	46	57	64	69	72	56	55	39	14	.....
1914	31	22	37	45	57	66	74	69	62	43	40	21	.....
Maximum:													
1911	68	64	74	80	88	95	94	98	93	78	66	62	.....
1912	53	50	55	73	87	93	91	96	89	83	71	56	.....
1913	[a] 58	61	67	84	90	95	97	97	90	83	73	36	.....
1914	50	62	66	77	87	95	98	98	92	81	75	50	.....
Minimum:													
1911	−19	− 7	11	11	22	42	40	41	38	11	−12	−11	.....
1912	−21	−14	−15	25	30	39	47	44	22	12	3	1	.....
1913	−28	−18	−11	16	26	41	37	50	24	12	13	− 9	.....
1914	8	−23	7	10	31	42	51	45	30	20	3	−15	.....

KILLING FROSTS.

Year.	Last in spring.		First in autumn.		Length of frost-free period.
	Date.	Minimum temperature.	Date.	Minimum temperature.	
		°F.		°F.	
1911	May 26	28	Oct. 3	31	129
1912	May 13	30	Sept. 16	31	124
1913	May 2	26	Sept. 19	31	140
1914	May 7	32	Sept. 13	30	129

[a] 11 days.

CROP CONDITIONS.

There were 944 farm units under cultivation on the project in 1914, comprising a total irrigated area of 60,532 acres. Crops were harvested from 59,536 acres. The average farm value of crops per acre was estimated at $14.95, or 55 cents more than in 1913.

The acreage, yields, and farm value of crops produced in 1914 are stated in Table II, the figures being obtained from the United States Reclamation Service.

TABLE II.—*Acreage, yields, and farm values of crops produced on the North Platte Reclamation Project in 1914.*

Crop.	Area.	Yields.				Farm values.			
		Unit.	Total.	Average.	Maximum.	Per unit of yield.	Total.	Per acre.	
								Average.	Maximum.
	Acres.								
Alfalfa hay	32,646	Ton	71,405	2.2	4.5	$4.50	$321,322	$9.90	$20.25
Alfalfa seed	922	Bushel	863	.9	3.0	8.00	6,904	7.49	24.00
Barley	2,261	do	53,022	23.4	90.0	.60	31,813	14.07	54.00
Corn	6,024	do	93,186	15.5	65.0	.75	69,889	11.60	48.75
Rye	245	do	1,363	5.6	10.0	.70	954	3.89	7.00
Millet seed	43	do	63	1.5	2.0	1.00	63	1.47	2.00
Stock beets	215	Ton	3,334	15.5	25.0	4.00	13,336	62.03	100.00
Cane for hay	15	do	14	.9	3.0	3.00	42	2.80	9.00
Timothy and wild-grass hay.	383	do	255	.6	1.0	8.00	2,040	5.62	8.00
Pasture	2,873						22,984	8.00	
Sugar beets	5,083	Ton	53,282	10.5	20.0	5.50	293,051	57.65	110.00
Oats	7,017	Bushel	146,211	20.8	80.0	.40	58,484	8.33	32.00
Potatoes	1,097	do	159,027	145.0	357.0	.35	55,659	50.74	131.25
Wheat	609	do	9,979	16.4	62.0	.85	8,482	13.93	52.70
Garden	305						5,177	16.97	
Less duplicated areas	3,892								
Total	59,536						890,202		
Value per acre								14.95	

Table III shows the number and value of the live stock on the North Platte project at the beginning and at the end of 1914. The figures are from a report made by the United States Reclamation Service.

TABLE III.—*Live stock on the North Platte Reclamation Project in 1914.*

Item.	Inventory, January 1.			Inventory, December 31.			Increased or decreased total value.
	Number.	Value.	Total value.	Number.	Value.	Total value.	
Horses and mules	3,785	$75.00	$283,875	4,618	$80.00	$369,440.00	$85,565.00
Cattle	2,956	45.00	133,470	3,190	45.00	143,550.00	10,080.00
Sheep	5,000	3.00	15,000	605	3.00	[a] 1,815.00	−13,185.00
Hogs	14,286	8.00	114,288	22,143	8.00	177,144.00	62,856.00
Fowls	37,620	.40	15,048	43,898	.40	17,559.20	2,511.20
Bees, hives	315	3.00	945	476	3.00	1,428.00	483.00
Total			562,626			710,936.20	148,310.20

[a] The sheep for 1913 were sold during the summer. Sheep brought to the project in the fall of 1913 for wintering or fattening are not included in the above figures.

The area producing sugar beets increased more than that devoted to any other crop. In 1913, 2,920 acres of beets were grown, while in 1914 the beet area was 5,083 acres, an increase of 74 per cent. The corn yields in 1913 were so encouraging that the corn area was increased from 3,561 acres in 1913 to 6,024 acres in 1914, an increase of 69 per cent. The alfalfa acreage was increased in 1914 by 18.9 per cent, or 5,166 acres.

DISPOSAL OF FARM CROPS.

The disposal of farm crops has been a serious problem on the project. The farmers are rapidly learning that live-stock industries afford the best means of disposing of most of the forage and grain crops grown, and they are extending their live-stock interests as rapidly as possible. The swine industry, particularly, is growing rapidly. The number of hogs on the project increased from about 14,000 in 1913 to 22,000 in 1914, and there are indications that the industry will be further enlarged. During the fall of 1914 about 2,500 head of cattle and 22,000 head of sheep were brought to the project for feeding. A few farmers are getting into the dairy business. It appears that the future development of the agriculture of the project will be directed toward the establishment of live-stock industries, and that the crop-disposal problem will be solved in this way.

EXPERIMENTS WITH IRRIGATED FIELD CROPS.

ROTATION OF CROPS UNDER IRRIGATION.[1]

The irrigated rotation work, which was started in 1912, occupies 80 quarter-acre plats. Nine of these plats are cropped continuously with the different crops grown in the rotations. There are eleven 2-year, three 3-year, four 4-year, and four 6-year rotations. The following crops are used: Alfalfa, 21 plats; beets, 14 plats; corn, 6 plats; flax, 2 plats; oats, 18 plats; potatoes, 13 plats; spring wheat, 5 plats; and winter wheat, 1 plat. One plat of corn and one of alfalfa are harvested by hogs and are not included in Table IV.

TABLE IV.—*Yields per acre of crops in the irrigated rotation experiments, Scottsbluff Experiment Farm, 1914.*

Number of plats.	Crop.	Yield per acre.			Number of plats.	Crop.	Yield per acre.		
		Maximum.	Average.	Minimum.			Maximum.	Average.	Minimum.
20	Alfalfa....tons..	7.21	5.7	2.86	13	Potatoes, bushels.....	319.3	215.8	119.2
14	Beets.....do....	21.71	16.51	13.35					
5	Corn...bushels..	78.0	65.1	41.4	5	Spring wheat, bushels.....	30.0	26.3	22.7
2	Flax.....do....	11.4	9.4	7.5					
18	Oats.....do....	95.4	77.3	51.1	1	Winter wheat, bushels.....	18.8	.....	.....

[1] These experiments are under the direct supervision of Mr. James A. Holden, who prepared the report here presented.

Table IV shows that there was a rather wide range between the highest and lowest yields on plats growing the same crop. Each crop was seeded on the various plats at the same time, with the same kind of seed, and received the same cultural treatment after seeding, so that the differences in yields may be due in part to the sequence in the rotation and in part to the cultural treatments of the preceding crop.

Table V brings out the most significant rotation effects in the three important annual crops in the rotation experiment. The plats are arranged in the order of their yields, from the highest to the lowest.

TABLE V.—*Crop yields per acre and preceding crops, Scottsbluff rotations, 1914.*

[MB indicates manure applied to the beet crop; OR indicates oats followed by rye, to be plowed under the following spring; OM indicates oats with manure applied to the stubble and plowed under for the following crop.]

Oats.		Beets.		Potatoes.	
Preceding crops.	Yield.	Preceding crops.	Yield.	Preceding crops.	Yield.
	Bushels.		*Tons.*		*Bushels.*
Alfalfa, alfalfa	95.4	Alfalfa, potatoes	21.17	Alfalfa, alfalfa	319.3
Alfalfa, potatoes	94.9	Alfalfa, oats	20.67	do	299.4
Oats, MB	89.4	MB, OM	19.87	do	280.0
MB, potatoes	86.4	Potatoes, OM	18.49	do	272.2
OR, potatoes	84.6	do	17.44	Potatoes, OM	253.5
Alfalfa, potatoes	83.7	MB, potatoes	17.24	Oats, MB	243.3
Oats, MB	83.6	Beets, wheat	16.57	Potatoes, MB	236.9
Alfalfa, wheat	83.4	Potatoes, oats	14.78	Oats, beets	216.0
Alfalfa, potatoes	82.6	Corn, oats	14.62	Potatoes, oats	146.2
Beets, potatoes	78.8	Beets, potatoes	14.50	Potatoes, beets	146.0
Oats, beets	75.8	Corn, oats	14.33	Potatoes, corn	142.5
Oats, oats	71.9	Beets, oats	14.20	Potatoes, OR	131.1
Alfalfa, corn	69.8	Potatoes, oats	13.94	Potatoes, potatoes	119.2
Oats, potatoes	69.4	Beets, beets	13.35		
Corn, flax	69.0				
Oats, wheat	65.2				
Oats, corn	56.6				
Beets, corn	51.1				

Probably the most conspicuous result of the rotation experiments is the beneficial effect of alfalfa upon the following crops and the stimulating effect of barnyard manure. These effects are shown in Table V, where the yields are given for each of the plats of the three most important annual crops. It will be seen from the table that with but two exceptions the highest yields were obtained from plats which had either grown alfalfa or had received one or more applications of manure. The manure was applied at the rate of 12 loads per acre.

Another fact of importance demonstrated in the rotation experiments is the possibility of seeding alfalfa in the fall after a crop of small grain has been removed. Heretofore it has been thought necessary either to sow alfalfa with the small grain as a nurse crop or to postpone seeding until the following spring. There has been some prejudice against sowing alfalfa with the small grain because of the consequent uncertainty of securing a good stand of alfalfa, and if the alfalfa is sown the following spring the crop obtained the first year is small. The practice of seeding in the stubble after the

small grain has so far resulted in a good stand and in giving nearly a full crop the following year.

In figure 2 is shown a plat of alfalfa which had been seeded in the stubble the previous year, after the removal of the grain crop.

THE USE OF HOGS IN DISPOSING OF CROPS.[1]

Since the beginning of the rotation experiments previously mentioned, two plats have been used each season as hog pasture. One of these plats has been in alfalfa and the other in corn. The hogs have been kept in the alfalfa plat from early spring until September, being fed a supplementary ration of corn. In September they have been turned into the corn plat to harvest that crop.

FIG. 2.—Alfalfa on plat KI-7, Scottsbluff Experiment Farm. This plat was seeded to alfalfa on August 15, 1913. The photograph was taken on May 25, 1914. This plat yielded at the rate of 5.8 tons per acre in 1914. Late summer seeding of alfalfa has been very successful at the experiment farm.

In order to provide for the continuous pasturing of hogs on the alfalfa it has been necessary to use two lots of hogs during the season. The first lot was composed of hogs farrowed the previous autumn. These were kept on the pasture from May 3 to July 2. The second lot was composed of hogs farrowed in the spring. These young pigs were placed on the pasture on July 8. A few of them were removed from the pasture on September 7, to be placed on the corn plat, and the remainder were kept in the alfalfa until October 6. During the entire pasture period the hogs were fed a supplementary ration of corn at the rate of 2 pounds of corn for each 100 pounds of live weight. They received, in addition, certain condiments, such as salt and phosphate rock.

[1] These experiments have been under the supervision of Mr. James A. Holden.

The net results of the season's pasturage on the alfalfa plats when computed to the basis of 1 acre show that the hogs made during the season a gain of 3,036 pounds of pork and consumed, in addition to the pasturage, 147.6 bushels of corn. If values of 7 cents a pound are assigned to the gains made and 60 cents a bushel to the corn consumed, the net return is $126 per acre. This estimated return is somewhat less than that obtained in the similar experiment in 1913, but is still sufficiently large to indicate that the use of hogs on alfalfa is a much more efficient method of utilization than the making of hay. While it is not known how much hay would have been produced by the plat which was pastured, it is

FIG. 3.—A part of the plats used in the alfalfa pasturing experiments with hogs at the Scottsbluff Experiment Farm in 1914, showing the portable houses and the method of dividing the pastures.

doubtful whether the yield would have exceeded the rate of 7 tons per acre, and the hay would have been worth only about $6 per ton.

The use of hogs in harvesting the corn crop from one of the rotation plats (rotation No. 65) gave the following results: There were four hogs on the plat for 49 days. The plat was one-fourth acre in size. The average initial weight of the hogs was 63 pounds, the final weight 107 pounds. The yield of the corn on the plat was estimated with care as 82 bushels per acre. The pork gain made was 262 pounds. If to this gain is assigned a value of 7 cents per pound, then the return per acre equals $73.36, or a return of 90 cents per bushel for the corn crop. This result is very close to that obtained from the similar experiments in 1913.

In pasturing the hogs on alfalfa, the method used was to divide the plat into two equal parts and keep the hogs on one part for a week or 10 days and then shift them to the other part. This is designated as the 2-pasture method. As has been noted above, the hogs on pasture were fed 2 pounds of corn per day for each 100 pounds of live weight. This is known as a 2 per cent supplementary ration. While it is known that this 2-pasture method with a 2 per cent supplementary grain ration gave very satisfactory results, it was deemed advisable to try some other rates of feeding for comparison. Consequently, some additional pasturing experiments with hogs were begun in the spring of 1914. These included one lot on pasture without any supplementary grain ration, one lot on pasture with a 1 per cent ration of corn, one lot with a 2 per cent ration of ground barley instead of corn, and one lot with a 3 per cent ration of corn.

In figure 3 are shown some of the plats of alfalfa used in these experiments. There were also some experiments in the use of concentrates and other forage as a supplementary feed while the hogs were harvesting the standing corn.

These experiments are being repeated in 1915, and it is expected that the results of the two seasons' work will then be published.

GRAIN VARIETY TESTS.

Winter wheat, rye, and emmer.—The winter wheat yields in 1914 were very low. The value of winter wheat as a crop for the irrigated lands of the project is questionable. Winter wheat does not fit well into any rotation, since the only crop that it may follow to advantage is early potatoes, a crop not grown extensively on the project. In general practice, winter wheat can be used only on new breaking or as a catch crop. Spring wheat, on the other hand, fits well into several rotations. Another advantage of growing spring-wheat varieties is that they are more certain and usually yield better than winter-wheat varieties in this section. This is illustrated in Table VI.

TABLE VI.—*Average yields of winter wheat and spring wheat at the Scottsbluff Experiment Farm, 1911 to 1914, inclusive.*.

Variety.	Yield per acre (bushels).				
	1911	1912	1913	1914	4-year average.
Spring wheat, average of 5 varieties	22.9	43.86	37.46	38.90	35.78
Winter wheat, average of 7 varieties	22.6	42.34	32.7	25.51	30.78
Difference in favor of spring wheat	.3	1.52	4.76	13.39	5.00

The average yields secured with winter wheat, rye, and emmer since 1911 are shown in Table VII.

TABLE VII.—*Yields of winter wheat, rye, and emmer at the Scottsbluff Experiment Farm, 1911 to 1914, inclusive.*

Crop.	Yield per acre.			
	1914		4-year average.	
	Grain.	Straw.	Grain.	Straw.
	Bushels.	*Pounds.*	*Bushels.*	*Pounds.*
No. 1	21.7	2,590	28.2	2,489
Kharkof, No. 1583	25.7	2,730	30.1	2,747
Crimean, No. 1437	27.6	2,120	30.2	2,505
Turkey, No. 1571	29.3	2,840	30.9	2,784
Kharkof, No. 1442	28.8	2,650	30.2	2,549
Crimean, No. 1435	20.5	2,710	25.6	2,550
Turkey, No. 1558	25.0	2,640	27.7	2,956
Ghirka	11.5	2,000	(1)	(1)
Rye, Twentieth Century	12.1	4,420	18.6	3,524
Rye, dwarf	10.1	3,920	18.0	3,213
Winter emmer	16.16	3,320	(1)	(1)

[1] Yields secured in 1914 only.

In the 4-year test there has been only a slight difference in the yields of winter-wheat varieties. The Turkey variety appears as promising as any of those tried. Emmer was sown in 1912, but it winterkilled so that no yield was obtained. In the winter of 1913–14 the crop again suffered severely from freezing, and not more than 50 per cent of a stand was left in the spring.

Spring wheat.—In 1914 one new spring-wheat variety was added to the test. This variety is the Dicklow, seed of which was secured from Idaho. The yields are shown in Table VIII.

TABLE VIII.—*Yields of spring-wheat varieties at the Scottsbluff Experiment Farm, 1911 to 1914, inclusive.*

Variety.	Yield per acre.			
	1914		4-year average.	
	Grain.	Straw.	Grain.	Straw.
	Bushels.	*Pounds.*	*Bushels.*	*Pounds.*
Ghirka	44.5	4,280	41.0	3,594
Defiance	30.0	4,000	33.4	3,404
Lambahara	44.8	3,690	40.6	3,380
Galgalos	45.6	4,425	40.1	3,578
Rysting Fife	29.6	4,150	32.0	3,639
Dicklow	35.6	3,860	(1)	(1)

[1] Grown in 1914 only.

All the spring wheats except the Dicklow were grown on one-tenth-acre plats and in duplicate, the yields shown in Table VIII being the average of two plats each year. The indications are that the Defiance, which is one of the most common varieties on the irrigated lands, might well be replaced by one of the higher yielding varieties. There

appears to be but little difference in the quality of the varieties named above.

Barley.—Eighteen varieties of barley were grown in 1914. Three of the varieties which were grown in 1913 were discarded. These varieties are: White Hull-less, which is the same as S. P. I. No. 12709; Hannchen (C. I. No. 531), which has a very weak straw and lodges badly; and Barbary (S. P. I. No. 26179), the straw of which is too short. The barleys were grown on one-tenth-acre plats in duplicate, except the four new varieties, which were grown on single plats of 0.04 acre each. The yields are shown in Table IX.

TABLE IX.—*Yields of barley varieties at the Scottsbluff Experiment Farm, 1911 to 1914, inclusive.*

Variety.	Yield per acre.			
	1914.		4-year average.	
	Grain.	Straw.	Grain.	Straw.
	Bushels.	*Pounds.*	*Bushels.*	*Pounds.*
Hull-less:				
Nepal (C. I. No. 262)	37.5	2,650	33.1	2,668
Unknown	41.6	2,500	40.3	2,602
Nepal (S. P. I. No. 12709)	37.6	3,480	32.9	2,979
Average	38.9		35.4	
Two-rowed:				
Franconian (C. I. No. 680)	61.0	3,680	57.0	3,334
Smyrna [1]	65.1	4,325		
Moravian [1]	91.6	2,100		
Svanhals [1]	64.0	3,725		
Average	70.4			
Six-rowed:				
S. P. I. No. 30393	72.2	2,730	70.5	2,943
Mariout	53.9	2,280	49.5	2,157
No. 90	29.1	4,450	44.4	3,752
Coast [2]	49.7	2,870	48.1	2,953
Scotch	62.8	2,210	56.9	2,238
Minnesota No. 105 (Manchuria)	37.0	3,330	42.2	7,675
Thomas	24.3	2,730	33.4	2,485
Dakota No. 206 [1]	72.9	3,500		
Average	50.2		43.1	
Hooded:				
Six-rowed	10.4	3,210	19.4	2,709
Two-rowed	40.0	2,910	43.1	2,495
Average	25.2		31.2	

[1] Grown in 1914 only.

[2] Commonly called California Feed.

As a rule, there is but a slight difference in the yield of the 2-rowed and the 6-rowed varieties. The hooded types have been very poor yielders, and the grain is not as plump as that of the bearded types.

The barleys were seeded at the rate of 7 pecks per acre, except the hull-less varieties; these were seeded at the rate of 6 pecks. The grain was sown April 14. Two irrigations were applied, the first on June 9–10, and the second on June 25–26.

Rate-of-seeding test.—All of the hull-less varieties of barley so far tested have been found to give low yields. This appears to be due in part to the fact that they stool or tiller very little. In 1914 an experiment was conducted to determine whether this might be overcome by heavier seeding. Triplicate one-twentieth-acre plats were seeded to barley of this type at the rates of 5, 6, 7, 8, and 9 pecks per acre. The average yields are stated in Table X.

TABLE X.— *Yields of hull-less barley in a rate-of-seeding test at the Scottsbluff Experiment Farm in 1914.*

Rate of seeding.	Yield per acre, average of three plats.		Rate of seeding.	Yield per acre, average of three plats.	
	Grain.	Straw.		Grain.	Straw.
	Bushels.	*Pounds.*		*Bushels.*	*Pounds.*
5 pecks	19.8	3,933	8 pecks	20.7	3,666
6 pecks	19.7	4,783	9 pecks	23.4	5,216
7 pecks	20.1	4,433			

As shown in Table X, the yield did not increase very markedly with the increase in the rate of seeding. The difference of 3.6 bushels per acre in the average yields of 9-peck seeding as compared with 5-peck seeding may, however, indicate that the yield is increased somewhat by heavy seeding.

Oats.—Thirteen varieties of oats were grown in 1914. Five of these varieties were grown in single one-tenth-acre plats, and eight were grown in duplicate one-tenth-acre plats. The yields obtained are shown in Table XI.

TABLE XI.— *Yields of oat varieties at the Scottsbluff Experiment Farm in 1914.*

Variety.	No. of plats.	Yield per acre.	Height.	Variety.	No. of plats.	Yield per acre.	Height.
		Bushels.	*Inches.*			*Bushels.*	*Inches.*
Canadian	1	107.0	43	Kherson	2	51.5	30
Swedish Select	2	73.7	42	Rustproof	2	48.1	27
Danish	1	70.0	40	Big Four	2	46.8	41
White Tartarian	1	67.1	34	Black Anthony	2	43.1	40
Newmarket	2	66.5	38	Wisconsin No. 1	2	42.8	40
Golden Rain	1	66.4	35	White Plume	2	40.6	26
Dakota No. 4	1	66.4	40				

The results obtained in the oat-variety test indicate that the Canadian, Swedish Select, Newmarket, and Dakota No. 4 are very good varieties for this section. The White Tartarian is a side oat, matures very late, and is not to be recommended. The Rustproof is a red oat and on account of its color, which is against it on the market, it should not be grown for sale. The Rustproof also has a rather short straw. The Black Anthony is objectionable on account of its color and late maturity.

SORGHUMS.

As stated in the 1913 report, the tests of kafir and milo have been discontinued, the season being too short to allow these crops to mature. In 1914, two strains of brown kaoliang and feterita were grown. About 20 per cent of each of these matured, but there was not enough to secure a yield test. Up to the present time, the indications are that the grain sorghums are not a profitable crop to be grown under irrigation in western Nebraska.

STOCK BEETS.

The production of beets grown for live stock on the North Platte project is increasing each year. The area of stock beets on the project has increased from a few small plantings in 1913 to 250 acres in 1914. Indications are that this acreage will be materially increased for a number of years.

The half-sugar beets are preferred by most of the feeders and are more extensively grown than mangels. These beets have a higher feeding value than mangels. The half sugars also keep better in storage and are not as quickly affected by freezing.

Yield tests have been made for two years. The results of these tests are stated in Table XII.

TABLE XII.— *Yields of stock beets at the Scottsbluff Experiment Farm in 1913 and 1914.*

Variety.	Yield per acre (tons).		
	1913	1914	Two-year average.
Yellow Tankard mangels	38.1	14.4	26.2
Giant Red mangels	36.5	17.8	27.1
Half-sugar beets	32.0	17.5	24.7
Danish Sludstrup mangels	.....	19.6	.....

The yields were very low in 1914 on account of the poor stands obtained. As a rule, these stock beets produce almost double the tonnage of sugar beets under similar conditions.

CORN.

In the variety test conducted,[1] 13 varieties of corn were grown in duplicate one-forty-eighth-acre plats. The yield weights were taken at the time the corn was husked. Then 60 ears taken from each variety were hung up and allowed to dry out. After two months of drying, the air-dry weights were taken and the yield computations made from those weights. The results are given in Table XIII.

[1] In cooperation with the Office of Corn Investigations of the Bureau of Plant Industry.

TABLE XIII.— *Yields of corn varieties at the Scottsbluff Experiment Farm in 1914.*

Variety.	Yield per acre.	Variety.	Yield per acre.	Variety.	Yield per acre.
	Bushels.		*Bushels.*		*Bushels.*
Australian Flint	85	Local White Dent	74	Northwestern Dent	63
Disco Dent × Calico	83	Martin White Dent × Calico	72	Ardmore Yellow Dent	63
Selection 133, dent	78	Martin White Dent	70	Cassia County Flint	60
Calico, dent	75	Brown County Dent	64	Youngheim Dent	45
Golden Glow Dent	75				

All the corn was cultivated five times and irrigated twice. Nearly all the varieties matured well in 1914. Although the Australian Flint produced the largest yield, this variety should not be grown to the exclusion of all others. It does not grow as tall as the dent varieties, and the ears are very close to the ground and difficult to harvest. For "hogging-off" purposes, the Australian Flint may prove valuable, as the hogs are usually turned into the field before the grain becomes hard.

From the results secured, the Calico appears to be the best of the dent varieties for local conditions. Although Selection 133 produced a slightly higher yield, it is a later variety and might not mature well in ordinary years.

POTATOES.

The work with potatoes[1] consisted of variety tests and tests of different seed stocks and of different cultural and irrigation methods. Ten standard varieties and ten seedling stocks were tested in 1914. The yields of these varieties are given in Table XIV.

TABLE XIV.— *Yields of potato varieties at the Scottsbluff Experiment Farm in 1913 and 1914.*

Variety.	Yield per acre (bushels).				Variety.	Yield per acre (bushels).			
	1914		Two-year average.			1914		Two-year average.	
	Marketable tubers.	Culls.	Marketable tubers.	Culls.		Marketable tubers.	Culls.	Marketable tubers.	Culls.
Eureka	259	66	237.2	49.2	No. 15342	134	30	133.6	30.8
No. 4452	223	66	260.2	86.2	No. 15094	143	71	131.5	52.1
Albino	251	57	230.1	51.2	No. 8090	50	75	127.5	71.6
Pearl	192	48	224.9	52.5	Green Mountain	50	61	124.1	72.1
No. 15335	250	67	223.3	66.4	No. 7451	77	45	108.0	50.8
No. 15411	192	40	181.4	43.6	Triumph	83	55	106.1	39.1
No. 8114	170	78	178.3	63.5	Peachblow	100	97	104.3	109.7
Early Ohio	142	48	156.7	47.0	No. 15255	106	78	90.5	34.0
No. 4942	60	90	137.0	119.1	Russet	.....	130	73.0	103.5
Rural	101	106	135.9	71.7	Irish Cobbler	233	90	.....	.....

The varieties bearing numbers are new varieties secured by crossing, which have not yet been given names. They are not on the

[1] Conducted in cooperation with the Office of Horticultural and Pomological Investigations of the Bureau of Plant Industry.

market at the present time. In 1911, 50 such new varieties were grown. Each year a number of them have been discarded. The yields in 1914 indicate that several others do not merit further trial.

For a late variety the Pearl is the best on the list. The Peachblow and Rural are both too late for this section in the average season. The long shape and uneven growth secured in the Russets make them undesirable for market. For early varieties, Early Ohio and Triumph come first. The Albino, though a good yielder, is about one week later than the Triumph. The indications are that the Albino may take the place of the Early Ohio, as it is not so liable to disease or uneven growth. The Eureka and Irish Cobbler are about equal. They are good midseason varieties and many farmers are growing them as a main crop. The one objection to these varieties is that on rich soil the tubers are likely to become too large and overgrown, but this may be prevented by closer planting.

The irrigation and tillage work with potatoes was practically the same as in 1911, 1912, and 1913. The experiments were as follows:

(1) Irrigate every other row throughout the season, shallow cultivation and ditching.
(2) Irrigate by the usual method, shallow cultivation and ditching.
(3) Irrigate the same as in No. 1, but deep cultivation and ditching.
(4) Irrigate the same as No. 2, deep cultivation and ditching.
(5) Irrigate alternate rows, shallow cultivation and ditching.
(6) Irrigate alternate rows, deep cultivation and ditching.
(7) Irrigate so that the plants suffer between irrigations, shallow cultivation and ditching.
(8) Irrigate the same as No. 7, deep cultivation and ditching.
(9) Irrigate so as to keep the soil moist throughout the season, shallow cultivation and ditching.
(10) Irrigate the same as No. 9, deep cultivation and ditching.

This work was conducted on duplicate one-twentieth-acre plats. The results of the work have been inconsistent. In three cases shallow cultivation produced the larger yield; in two cases deep cultivation proved better; in four cases shallow cultivation gave the smaller percentage of culls; and in one case deep cultivation produced the least culls. The largest yields were obtained where the soil was kept moist throughout the season, the average yield on land so treated being 296.8 bushels per acre.

The poorest shaped tubers were produced on the plats where the plants were allowed to suffer between irrigations; the average yield in these cases was 244.4 bushels per acre. The lowest yields were obtained by irrigating every other row alternately, the average being 215 bushels per acre. The irrigation of alternate rows did not give as good results as were obtained by ordinary irrigation.

Potato seed stock.—For two years tests have been conducted to determine what stock is best adapted for seed. The following seed stocks were used: Immature seed, obtained by late planting and

early harvesting; field-run seed, or seed taken at random from the main crop; field-selection seed, or seed from the best appearing hills in the field; bin-selection seed, or the best appearing tubers in the bin; culls; and whole large tubers. This work was conducted with two varieties, Pearl and Eureka. The highest yield was obtained from the Pearl variety, 297.6 bushels per acre from immature seed. The lowest yield of Pearls came from field-run stock, which produced 78.6 bushels per acre. The results secured with the Eureka were somewhat different. The highest total yield was obtained from large whole tubers, which produced 367 bushels per acre; and bin selection gave the lowest yield, 305 bushels per acre.

Seed stock from irrigated and dry land has been tested for three years. In this time there has been no material difference in yield associated with differences in the source of the seed, and there has been no apparent running out of the stock. This work terminated in 1914, as the tubers grown on the dry land were so badly affected with dry-rot that it was not advisable to keep them for future use.

The yields secured with the dry-land and irrigated seeds, both on dry land and on irrigated land, in 1912, 1913, and 1914 are shown in Table XV.

TABLE XV.—*Yield of potatoes from dry-land seed and from irrigated-land seed at the Scottsbluff Experiment Farm in 1912, 1913, and 1914.*

Variety.	Seed from—	Yield per acre (bushels).							
		On dry land.				On irrigated land.			
		1912	1913	1914	3 years.	1912	1913	1914	3 years.
Early Ohio...	Dry land.....	133.3	40.7	20.8	64.9	122.5	140.9	138.0	133.8
Do.....	Irrigated land.....	98.3	26.3	33.3	52.6	108.3	138.3	138.0	128.2
Eureka.....	Dry land.....	118.0	60.0	10.0	62.6	153.0	186.0	195.0	178.0
Do.....	Irrigated land.....	115.0	82.0	21.0	72.6	149.0	330.0	190.0	223.0

If the three years' average yields are considered, the dry-land seed of Early Ohio was slightly better than the seed from the irrigated land, the yields from dry-land seed being slightly higher on both dry land and on irrigated land. The reverse is true, however, in the case of Eureka. Considering all the results secured, dry-land seed was practically as productive as seed from irrigated land when planted on either dry land or irrigated land. In other words, the results fail to show any consistent or significant differences.

CULTURAL METHODS WITH SUGAR BEETS.

Depth of plowing.—The season of 1914 was the third year in which the effect of plowing land at different depths for sugar beets has been tried, the depths being 4, 8, 12, 16, and 20 inches. The 16 and 20

inch plowing has to be done by following the breaking plow with a subsoiler. The work in 1914 was done on triplicate one-twentieth-acre plats. In 1912 and 1913 it was done on one-twentieth-acre plats in duplicate. The three years' results of this work are given in Table XVI.

TABLE XVI.—*Yields of sugar beets on land plowed at different depths at the Scottsbluff Experiment Farm in 1912, 1913, and 1914.*

Year and number of plats averaged for each depth of plowing.	Yield per acre (tons).				
	Plowed 4 inches.	Plowed 8 inches.	Plowed 12 inches.	Plowed 16 inches.	Plowed 20 inches.
1912, 2 plats	20.5	18.4	19.4	20.1	16.5
1913, 2 plats	21.7	21.2	20.5	21.3	21.6
1914, 3 plats	14.6	14.0	14.8	14.7	14.4
3-year average, 7 plats	18.9	17.8	18.2	18.7	17.5

As shown in Table XVI, the depth of plowing had no consistent effect on the yield of beets. The most important point indicated by the results is that very deep plowing and subsoiling are not profitable on the experiment farm. The deep plowing and subsoiling failed to increase the yield, and the cost of the operations is considerably greater than that of relatively shallow plowing.

Method of cultivating sugar beets.—The object of this work was to determine the effect of different tillage methods upon the yield of sugar beets. Various methods were tried, but there was no material difference in the yields secured, whether the cultivation was deep or shallow or deep early in the season and shallow later in the season. It appears that so long as the surface soil is kept in good tilth and the weeds are kept out of the crop very little difference in yield can be expected to result from the different methods of cultivation.

SEEDING ALFALFA.

For several years the seeding of alfalfa in grain stubble in August has been practiced with good results. In 1913 a test was started to determine the best method of preparing the stubble land for this late summer planting. The soil preparation previous to seeding consisted of single disking and double disking and harrowing, while some land was not given any preparation. The seeding was done August 19–20, at the rate of 13 pounds of seed to the acre, the seed being planted with a press drill.

There was no difference in the stands of alfalfa, but in the spring of 1914 there was some drifting of soil on the double-disked land. Good stands were secured by all three methods. The less preparation given the soil previous to seeding the alfalfa in late summer the less will be the danger of the blowing and drifting of the soil. Stubble

seeding without disking would be rather difficult where there is a heavy growth of weeds. In such a case it may be desirable to rake or harrow the field before seeding.

PASTURE GRASSES.

The pasture grasses seeded in 1913 and discussed in the report for that year made a good growth during the season of 1914. As these grasses have not yet fully covered the ground, extensive pasturing tests will not be made until 1915. Nearly all the grasses seeded came through the winter of 1913–14 in good condition except the Italian rye-grass, of which about 50 per cent was winterkilled.

One of the pasture mixtures planted in 1913 contained alfalfa seed at the rate of 2 pounds per acre. This produced enough alfalfa among the grasses to cause bloat in the cows that were on the pasture in 1914. The pasture mixture containing white clover did not cause any bloating in 1914, but it is as yet impossible to say to what extent clover may be used in such a mixture to the best advantage and without causing any injury. It is likely that at least 2 pounds of white-clover seed per acre can be used without bad results.

ORCHARD TREES AND SMALL FRUIT.

The fruit trees planted in the orchard came through the winter of 1913–14 in good condition. The apple varieties are Wealthy, Oldenburg, Patten, Northwestern, Pewaukee, Longfield, Whitney crab, Florence crab, University, Anisim, Hibernal, and Hyslop crab.

Of the plums Wolf and Forest Garden made a good growth, but bore no fruit in 1914. The Sapa and Opata bore good fruit, but as the Sapa freezes back considerably some years it can not be highly recommended.

The Montmorency cherry and the Compass, which resembles a native plum, bore some fruit for the first time in 1914, but not enough to make a yield record.

A number of red raspberries were tried, but none proved hardy without winter protection. The Sunbeam, Cuthbert, Miller, and Marlboro are good varieties. The Sunbeam is a very tart berry and for eating raw is not as desirable as the others named.

Of the blackcaps the Cumberland and Gregg proved to be good varieties. They require winter protection.

Strawberries have given good results. The varieties tried were Dunlap, Glen Mary, Brandywine, Dakota, Marshall, Aroma, Klondike, and Gandy. In adaptability and yield they rank in the order named.

Of a large collection of grapes grown, only the Moore, Dakota, and Worden have been able to survive the winters.

TREES AND ORNAMENTALS.

A number of evergreens were set out in the spring of 1914. Most of these were red cedar and arbor vitæ. These trees made a good growth and over 90 per cent were alive in the fall.

During the winter of 1913–14 the black locust and a few elms froze down. This is the third year that the locusts have suffered winter injury and it is thought best to discard them from future plantings. Nearly every year some of the elms freeze. For future plantings the hackberry will be used in place of the elm. Of the evergreens, the jack pine and Scotch pine made the best growth. Hard maple, Norway maple, mountain ash, and German linden have withstood two winters, and their hardiness appears to be practically certain.

Of the shrubs planted, Calycanthus, Tamarix, Diervilla, Deutzia, and Rhodotypos have not proved hardy. Snowball, lilac, honeysuckle, high-bush cranberry, waxberry, dogwood (*Cornus tartarica*), elder (common and golden), fringe tree, *Spiraea vanhoutei*, mock orange, barberry, and Russian Artemisia are perfectly hardy.

Of the flowering plants, the iris, both German and Siberian, do well; sweet William, peonies, Chinese clematis, and Hibiscus are hardy. It is well to cover all of these plants with straw or manure during the winter.

VEGETABLES.

In the vegetable garden three additions were made to those reported on last year. After trying practically all of the Lima beans (butter beans) it was believed that the season is too short for them. In 1914, however, the Henderson bush Lima was grown and gave excellent results, yielding very abundantly.

New Zealand spinach is a plant that should be tried in the gardens. One planting is sufficient to produce an abundance of greens throughout the season.

Black Mexican sweet corn was again tried. It can not be recommended for this section. The skin is inclined to be tough, and when the corn is canned the color is not good.

A detailed discussion of cultural methods for growing vegetables on the North Platte Reclamation Project has been published by the Nebraska Agricultural Experiment Station.[1]

Approved:

WM. A. TAYLOR,
Chief of Bureau.

JULY 24, 1915.

[1] Knorr, Fritz. Vegetable gardens on irrigated farms in western Nebraska. Nebr. Agr. Exp. Sta. Bul. 142, 24 p., 3 fig. 1914.

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1915